

What is claimed is:

1. A catalyst component useful for the co-polymerization of ethylene and an alpha-olefin, wherein the catalyst component is prepared by:

(i) providing a magnesium halide composite support by treating metallic magnesium with an alkyl halide or aromatic halide, a transition metal compound having the structural formula $M(OR)_aX_{4-a}$, at least one electron donating compound containing at least one ether group, and at least one organo-silicon compound having at least one silicon-oxygen bond; wherein M is selected from the group consisting of Ti, Zr, Hf, V, and Cr; R is a C_{1-20} hydrocarbon, X is halogen, and a is 1 to 4;

(ii) treating the magnesium halide composite support with a halogenized transition metal compound and a chelating diamide compound in the presence of one or more compounds selected from the group consisting of organo-magnesium compounds, halogenized silicon compounds, and halogenized boron compounds.

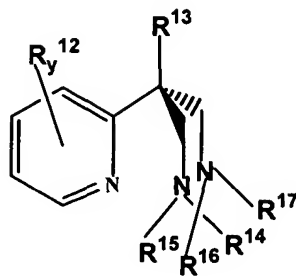
2. The catalyst component of claim 1, wherein the organo-silicon compound is selected from $Si(OR^1)_bR^{2-4-b}$, $R^3(R^4_2SiO)_cSiR^5_3$, or $(R^6_2SiO)_d$; wherein wherein R^1 is a hydrocarbon having 1 to 20 carbons; R^2 , R^3 , R^4 , R^5 and R^6 are independently hydrogens or hydrocarbons having 1 to 20 carbons; b is 1 to 4; c is 1 to 1000; and d is 2 to 1000.

3. The catalyst component of claim 1, wherein the chelating diamide compound has the formula:



wherein R^1 , R^2 , R^3 and R^4 are independently hydrogen, C_{1-20} alkyl, C_{1-20} alkenyl, C_{1-20} alkylsilyl, C_{1-20} alkenylsilyl, aryl, arylsilyl, or halogenated derivatives of C_{1-20} alkyl, C_{1-20} alkenyl, C_{1-20} alkylsilyl, C_{1-20} alkenylsilyl, aryl, or arylsilyl; provided that at least both R^1 and R^3 are hydrogen, trimethylsilyl, or triethylsilyl group; R^5 is hydrogen or C_{1-20} hydrocarbon, and x is from 1 to 7.

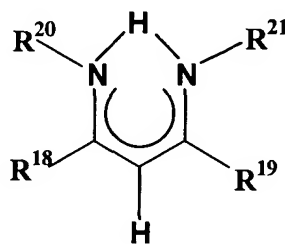
4. The catalyst component of claim 1, wherein the chelating diamide compound has the formula:



(II)

wherein R^{12} is independently hydrogen or C_{1-20} alkyl, or two R^{12} groups may together form a ring, y is 1 or 2; R^{13} is hydrogen or C_{1-40} alkyl; R^{14} , R^{15} , R^{16} and R^{17} are independently hydrogen, C_{1-20} alkyl, C_{1-20} alkenyl, C_{1-20} alkylsilyl, C_{1-20} alkenylsilyl, aryl, arylsilyl, or halogenated derivatives of C_{1-20} alkyl, C_{1-20} alkenyl, C_{1-20} alkylsilyl, C_{1-20} alkenylsilyl, aryl, or arylsilyl; provided that at least both R^{14} and R^{16} are hydrogen atom or trimethylsilyl or triethylsilyl group.

5. The catalyst component of claim 1, wherein the chelating compound has the formula:



(III)

wherein R^{18} and R^{19} are independently hydrogen, C_{1-20} hydrocarbon, or R^{18} and R^{19} groups may together form a ring; R^{20} and R^{21} are independently hydrogen, C_{1-20} alkyl, C_{1-20} alkenyl, C_{1-20} alkylsilyl, C_{1-20} alkenylsilyl, aryl, arylsilyl, or halogenated derivatives of C_{1-20} alkyl, C_{1-20} alkenyl, C_{1-20} alkylsilyl, C_{1-20} alkenylsilyl, aryl, or arylsilyl.

6. The catalyst component of claim 1, wherein step (ii) further comprises treating the magnesium halide composite support with a halogenated transition metal compound of the formula $m(M^1X^1_a) \cdot n(M^2X^2_b) \cdot o(THF)$, wherein M^1 and M^2 are independently selected

from the group consisting of Ti, Zr, Hf, Al, V, Al, and Cr; X^1 and X^2 are halogen; a and b are independently 2 to 5; and m, n, and o are independently 0 to 4.

7. The catalyst component of claim 6, wherein the halogenated transition metal compound is selected from the group consisting of $TiCl_4$, $ZrCl_4$, $HfCl_4$, $TiCl_4 \cdot 2THF$, $TiCl_3 \cdot 3THF$, $3TiCl_3 \cdot AlCl_3$, $CrCl_3 \cdot 3THF$, and $VCl_5 \cdot TiCl_4$, $TiCl_4 \cdot 2THF$, $TiCl_3 \cdot 3THF$, $3TiCl_3 \cdot AlCl_3$, and $CrCl_3 \cdot 3THF$.

8. The catalyst component of claim 1, wherein step (ii) further comprises treating the magnesium halide composite support with an organo-magnesium compound having the formula $R'MgR''$, wherein R' and R'' are independently C_{2-12} alkyl groups.

9. The catalyst component of claim 1, wherein step (ii) further comprises treating the magnesium halide composite support with a compound having the formula $MR_{m-a}X_a$, wherein M is a Group 13 or Group 14 element, R is a C1-20 hydrocarbon, X is halogen, m is a number equal to the valence of M, and a is 1 to m.

10. The catalyst component of claim 1, having the formula $Mg_mTiX_n(OR)_p(Si)_q(D)_r$, wherein X is halogen, D is a diamine, and m, n, p, q, and r are numbers satisfying inequalities $1 \leq m \leq 61$, $1 \leq n \leq 116$, $0.05 \leq p \leq 50$, $0.1 \leq q \leq 20$, $0.1 \leq r \leq 10$ and $m < n$.

11. The catalyst component of claim 1, further comprising one or more trialkylaluminum species selected from the group consisting of trimethylaluminum, triethylaluminum, triisopropylaluminum, and tri(n-octyl)aluminum.

12. The catalyst component of claim 11, wherein the molar ratio of the trialkylaluminum to transition metal is about 1 to about 1000.